United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Salt Lake District Office
2370 South 2300 West
Salt Lake City, Utah 84119

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

7000
(UT-022)

Dr. Dianne Nielson
Director, Utah Div. of Oil, Gas, and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84106

Dear Dianne:

Thank you for your participation in TRC activities. I am sending you copies of draft minutes from the meeting held on November 3, 1992.

The next meeting of the Technical Review Committee is tentatively scheduled for February 2, 1993 at 9:00 a.m.. Have a happy holiday season and I look forward to seeing you at the next meeting.

Sincerely,

Deane

Deane H. Zeller
District Manager

Enclosure
As stated above

Minutes of the Technical Review Committee
Meeting of November 3, 1992
Recorded by Philip Allard

Attendance:

Committee Members:
- Paul Anderson (PA)
- Craig Forster (CF)
- Jim Kohler (JK)
- Dianne Nielson (DN)
- Wally Gwynn (WG)
- Stanley Plaisier (SP)
- Ton Netelbeek (TN)

BLM Representatives:
- Phil Allard (PhA)
- Mike Ford (MF)
- Alan Rabinoff (AR)

U.S.G.S. Representatives:
- Lee Case (LC)
- Jim Mason (JM)
- Ken Kippe (KK)
- Joe Gates (JG)

Preliminary Meeting:

The meeting was held in the conference room of the Salt Lake District Office, Bureau of Land Management. The representatives of the U.S.G.S. were not present during the premeeting. The meeting started at 9:00 am.

1. PA introduced the minutes from the meetings held on 8/10/92 and 9/11/92. PA pointed out two typographical errors in the post meeting section of the 8/10/92 minutes. "October 3, 1992" should read "November 3, 1992", and "(less than 100")" should read "(less than 100')". SP pointed out a typo on page four, item 13 in the 9/11/92 minutes. "!%" should read "1%". The minutes were approved as corrected.

2. PA pointed out that the charter called for annual elections of officers. Therefore there will be an election of officers at the first meeting held in 1993.

3. PA then asked for a summary of the status of the weather stations that are a component of the study. PhA said that the weather station had been installed on the salt crust in September approximately 1 mile north of the northern extension of the Salduro dike. PhA said that the weather station was installed by the same individual who had instrumented the Pilot Valley. He said that relative humidity was measured by sampling air at two elevations and running the air through the same sensor. This method would

reduce any error introduced to the measurement from the sensor itself. PhA also said that the Utah Climate Center people indicated that it might be possible to extend the record of the station backward based on the data collected at the station on the dike of the west pond. DN asked if they could extend evaporation backward. PhA said that this probably wouldn't be possible unless evaporation data were being collected at the west pond station.

4. PA discussed the progress report. CF said that they drilled wells near I-80 and shallow wells in the salt crust. WG asked if they had water chemistry. JK sid that they have some data already on a data base and should be able to share it with WG. TN asked that maps be provided. SP said they're still having problems establishing survey control so there won't be any maps.

5. DN asked if the USGS was on schedule. TN said that he didn't feel comfortable about the status of work in Pilot Valley. CF said that they have drilled one observation well in Pilot Valley and core was provided to him for analysis. They have incorporated up to 100 existing piezometers on Pilot valley. The work that they are doing will acquire data on existing wells. CF says he thinks Pilot is useful but may not be a direct control. It doesn't have thick salt crust so it is not a direct analog. PA asked if brine chemistry is similar. CF didn't know but he speculated that it was. CF has collected isotope data and chemical data on Pilot Valley.

6. TN said that at one time we were looking at collecting data on the bombing range. He asked about the status of that project. PhA and JK discussed the status of that work. JK said that he had gone to the area on October 28, 1992. He said that it was evident that drainage of minerals from the federal land to the private land was occurring. He said that further work would be done in the area in the spring of 93.

This concluded the pre-meeting. Representatives of the USGS entered at this time. The USGS was represented by:

Lee Case (LC)
Jim Mason (JM)
Joe Gates (JG)
Ken Kippe (KK)

1. PA invited JM to start his presentation. JM started by saying that he had not finished the preparation of the water level maps. These were still stalled because Don Buhler of the BLM had not provided corrected elevation measurements. JM said that there were two surveys made of the wells and elevations. He said that the elevations of several of the wells did not agree and he had asked the BLM to correct this. JM said that a good percentage of the wells were off by .2 to .4 feet and the measurements were only a year apart. PA asked if there was a possibility that the salt crust had moved. JM said that he didn't think so because the measurement was to the top of the well casing, not the surface.

George Piper spoke with Don Buhler about 1.5 weeks earlier. JM asked that the BLM strive to get the correction of the data to a higher level on Mr. Buhler's list of priorities. PhA said that he would speak to management about this. JM said that some of the wells put in in September still need to be surveyed. If necessary the USGS can survey these wells but that is not needed right now. The USGS is waiting on the BLM to act on this before the potentiometric surface map can be prepared.

2. When considering the effect of density on the water elevation, the shallow wells will be normalized to a uniform 4,190' elevation. The other approach would be to look at the length of the water column to correct for density. The shallow wells may not need this. For the deeper wells they will need to look to see if there are density variations within the water column. The shallow wells are bailed, but the deep wells were purged before they were sampled. CF asked what the USGS would do if they found that there was variation in the density of the water in the deep wells. JM answered that they would have to purge the well before sampling. CF suggested that one could log electrical conductance and relate that to density, and then sample the well. JM said that that system wasn't uniformly accepted and they would have to buy additional equipment. JM said that, in addition to the deep well in the center of the salt crust, OW5 and OW6 might also have differences in density.

3. JM reported that last month they put in 5 additional wells. They were completed to a depth of 63 feet. They planned two more, but they encountered drilling problems which prevented the completion of these wells. They don't yet have the location of these new wells in their data base because they are not yet surveyed. These additional wells compete two cross sections. One is east of where the collection ditch crosses the freeway and the other is a line starting near the Salduro loop at about the three foot salt thickness contour on the map provided in the package handed out at the meeting. One cross section is made of three wells and the other is made of four wells. There is one well south of the railroad on both lines. JM reported that USGS has their own GPS system but it is not as accurate as is the BLM cadastral survey equipment so they are waiting on cadastral survey. They have established more data points in the study area than are shown in the materials handed out at the meeting.

4. In August they sampled 46 data points for water chemistry and collected 17 oxygen-deuterium isotope samples, including 6 samples from the line of wells. They have not yet received a complete data set from the lab. All of the nested wells and two of the shallow wells were sampled for isotopes. Some of the isotope data are back, but the data set is not complete. The pore fluids from core are listed by location on figure 2 of the handout and the data are shown in tables. PA asked if they had problems getting the core. JM said that these core were of mud which is very simple to obtain unlike the salt crust. They were analyzed for Cl:Br ratios. They were hoping for some reasonable profiles. Table two lists ratios

and depths. The depth listed is the bottom of the interval. For example, 5 indicates the sample is the 0 to 5 cm. interval. Blair Jones is still looking at these data. They haven't gotten any interpretations back from him yet. There is a possibility of a diffusion gradient in wells 1 and 2. The analysis will continue. The additional core will be looked at at a reconnaissance basis rather than in this level of detail. PA asked if in these data if the 0 depth was the surface or the base of the salt crust. JM said that is represents the base of the salt crust. JM said that in the he found the salt crust thickness to be different than indicated on the map prepared by Brooks. In the far northeast the map indicates a thickness of the crust between 1 and 2 feet. JM said that they measured the thickness to be 6 inches when they drilled. He said that could be a function of the density of data available when the contour map was prepared. In other locations they found the salt crust thickness to be similar to that indicated by the map.

5. JM said that they have been more successful in obtaining core returns on the salt crust but they still have been unable to get a continuous core. The basal part of the crust has large salt crystals that are not cohesive and are difficult to collect. WG asked if they had been able to get a density measurement on the crust. JM said that they were nota bale to get that measurement. Tim Lowenstein of SUNY is going to review the material that was collected to see if he can get data on fluid inclusions. To get bulk density we will need to collect core from several different locations. JM said they didn't pursue the use of cement coring equipment because it is beyond the scope of the study. JM said they would try to get these data if they were directed by the BLM to do so. Salt coring was then discussed. JM said that there is a hard surface layer from 4 to 6 inches thick. They set the core tube behind the auger in the beginning and after the hard salt was penetrated, the core tube was extended in front of the auger. After a certain point the core wouldn't go into the core barrel. This is probably because of the mushy consistency of the material and the large salt crystals.

6. JM then talked about USGS plans for the future. A water level measurement run is scheduled for this winter. Safety is a concern. Contours on the water level will be done when the USGS gets elevation data from the BLM. USGS plans to sample the 5 new wells sometime this fall. Geochemical interpretation of the data will continue. CF asked how many wells in Pilot valley are included in the study. JM said that about 30 to 40 wells are included but they have not yet collected samples.

7. KK was then introduced and he made a presentation about the status of the computer modeling effort. KK said that his approach is to start with a simple model and make things more complex as the more simple model is verified. The code that he is using has been complete for four years, but has only been used by the USGS for 3 or 4 projects. Everything is being input in English units but it is being processed in metric units. KK started with a rectangular 3 dimensional model. The first run will check Line's flow balance.

KK will verify the simulated balance calculations using a hand calculator to assess the reasonableness of the boundary conditions used in the model. This will help identify where more data will be needed.

8. The grid used is 16 miles E-W and 11 miles N-S. Flux to the west is modeled as leakage to the alluvial fan aquifer. The ditch is represented as leaky with flow from the aquifer to the ditch. The model starts with a uniform fluid. KK hasn't yet introduced variable density and solute transport. The eastern boundary of the model is assumed to be a specified pressure. This may be changed to a leaky boundary. The southern boundary was also assumed to be a specified pressure. An impermeable boundary was assumed at the base. Initial data indicate leaking upward from below so this assumption may be changed. The northern boundary is a specified flux of net precipitation (precipitation less evaporation). The model assumed homogeneous properties for porosity and permeability. This is the very simple beginning point.

KK then showed a slide showing the numbers he used in the model. This slide is in the materials handed out at the meeting. Most of the numbers he derived from the work of Lines. He used the numbers related to a plastic clay to represent the compressibility of the medium. The grid used is nine nodes by six nodes by three nodes which is very coarse. There is at present no time element in the model. CF asked if the model was assuming a steady state balance. KK said that this run of the model is not to make conclusions about the hydrologic system but rather to identify the appropriate structure of the model. The flux to the south in the model run is much larger than Lines data indicated.

KK said that he also made a run of the model to show water level contours. Most of the leakage into the ditch is in the federal lease area, but the aquifer to ditch flow is in balance south of the freeway. Lines came up with a ground water divide in the basin. At this point the model doesn't show the divide. At this point KK is not seeing any great inconsistencies between the model an observations, but they may be seeing an unrealistic decline in water levels. KK needs to validate the model with the data that is being collected in the present study.

9. KK reported that he is also working with a cross sectional model to determine the regional influence of the ditches. The question could be stated as "Is there a plume of different salinity created by the ditches?". An impermeable base and on one side of the ditch was assumed. There is potential for leakage out of the defined area beneath the ditch; however, for now the ditch is structured as a specified pressure boundary.

10. KK said that from here he will work to make the geometry of the model more realistic, work on improving the simulation of the south boundary, look at the assumptions made about the east boundary, and compare the model to the elevational data when it is available. KK hopes to have the next generation of the model

completed by Christmas. KK was asked where the south boundary would be placed. KK said that they were looking at a ditch along the south of the freeway. Presently they don't have elevational survey data on the ditch and they don't have gauge data on the ditch; they would also need permission of the company (Reilly) for access. Failing this they would use a line of wells parallel to I-80 as the boundary.

11. PA asked about fractures in the system. KK said that he hopes he can avoid going into a fracture based model because of the lack of data on fracture size and spacing. Hopefully, the fractures can be handled by assuming a modified porous media. CF said that he didn't see that there was enough time to develop a fracture flow model. JM said that they know that there are fractures and that they are a potential problem, but all the data has been collected in this fractured system so a model that fits the data well will be accounting for the fractures.

12. CF asked about the schedule of the study. JM said that the USGS has to look at this but wouldn't comment on it today. JM said the biggest change in the study related to the pond migration study where little progress has been made. LC said they have to prepare a schedule for their own purposes and can make that schedule available to the TRC.

13. PA suggested that the next meeting be held on 2/2/93 at 9:00 am. At this point the main meeting adjourned.

Post Meeting.

1. PA mentioned the pond migration issue. It was mentioned that BYU had been contracted to water resources to determine areas of ponds from LANDSAT imagery. Boyd Austin of water resources may be able to help with this. WG said that he has a photo mosaic from 1946 of the salt flats area in his office.

2. PA said that he was interested in seeing how the money budgeted for the pond migration component of the study would be spent and how they respond to the request for information on scheduling.

3. PA asked if the measurement of the density of the salt crust was an important component of the study. CF asked if anyone had investigated geophysics. PA said that conventional density logging might work very well. WG asked if the methods used by UDOT would have any application. PA said that you would need to ground truth any method used. WG said that you should be able to use some simple method to do this. CF said that maybe USGS isn't interested in collecting this data because they don't know what they would do with it. Maybe they are looking for some reason to do it. PA asked if the TRC wanted to recommend the collection of density data on the salt crust to the BLM. JK said that there seem to be insolubles incorporated in the crust. Maybe we also need to have some stratigraphy on the crust. PA said that we don't understand the transmissivity of the salt crust as an aquifer. DN said that

the dynamics of the salt crust is an important part of the study.

4. PA introduced the following motion:

> The TRC requests that the USGS propose one or more methods for measuring the density and stratigraphy of the salt crust with a recommendation on the preferred method for making these measurements by 2/2/93. The TRC feels hat a density profile through the various layers of the salt crust is an important component of the study. Spatial and temporal variations also need to be addressed.

WG seconded the motion and it was passed.

5. CF said that he was pleased with the presentation of the model and the status of the model. He felt that it might be behind schedule but progress was being made.